

11. *Descriptions of New and Little-known Lizards and Batrachians from South Africa.*—By JOHN HEWITT.

(With Plates XXXV-XXXVII and 9 Text-figures.)

Rhoptropus barnardi sp. nov.

(Plate XXXV.)

Types.—Four adult specimens and two juveniles in the collection of the South African Museum (No. 16639), taken near Eriksson's Drift, Kunene River, by Messrs. K. H. Barnard and R. F. Lawrence, 1923. The species is appropriately named after Dr. K. H. Barnard, widely known through his important works on the Crustacean fauna of South Africa.

This species is nearly related to *R. afer* Ptrs., which was collected somewhere in Damaraland by Wahlberg, but is at once distinguished therefrom by the pointed snout, the well-marked row of chin-shields, and probably also by the segmented tail.

Head a little flattened, shallowly concave between the orbits; snout elongate and depressed but rather sharply pointed, canthus rostralis absent, nostril pierced in the centre of a rounded swelling formed by three nasal scutes, the two swellings only a granule apart; behind this swelling the side of the snout presents a distinct depression; rostral scale with upper margin shaped like an inverted flattened V, having a short median prolongation between the nasal swellings; scales on the snout larger than those on the middle of the back, and considerably larger than those on the occiput; the largest scales are situated immediately in front of the orbit superiorly, and they are keeled; about 12 upper labials and about 8 lower labials; mental and first two lower labials on each side much elongated, and adjoining these in a transverse line are 6 chin-shields which are considerably larger than the granules following them posteriorly, the line of enlarged shields extending also for some little distance obliquely backwards on each side of the gular region; eyelid incomplete as a granular fold, ventrally and postero-ventrally, its scales being granular dorsally but larger and flattened anteriorly. Dorsal surface of body with

more or less rounded granular scales, which are often very faintly keeled or tubercled; ventral surfaces with flattened scales which for the most part are not imbricate, but on the throat and sternal region are more or less sub-imbricate; the larger ventral scales are sub-hexagonal, and their posterior borders are very faintly crenulated (when examined under a compound microscope), this crenulation being traceable even in some of the gular scales; in front of the vent, two groups of 3 preanal pores with a single simple scale intervening, or 7 pores in a continuous line.

Tail depressed and segmented, the first segment being well distinguished by a deep lateral constriction at its junction with the second; weaker lateral constrictions are also traceable between the several immediately succeeding segments, but more distally the segmentation is only conspicuous ventrally; along the greater portion of the mid-ventral region there is a double row of enlarged scales, each segment, except towards the base of the tail, having 3 pairs of such scales, the hindermost pair of each segment being the largest; dorsally all the caudal scales are granular, arranged in transverse lines. Thirteen segments occur in one specimen, the remaining third of the total length being probably reproduced; it is thin and slender, tapering to a fine point. One specimen has a reproduced tail, the break having taken place at the junction of the second and third segments. In this specimen the new tail is unsegmented, having granular scales above but ventrally along the midline a single row of enlarged scales which are much elongated transversely.

Digits free, first toe well developed, third extending a little beyond the fourth. An enlarged flat nail-like distal scale on each digit superiorly, but no retractile claw; instead of the claw, a small triangular scale immediately succeeds the above-mentioned nail-like scale. Upper surface of each digit otherwise with small scales, which enlarge somewhat over the digital expansion. Eight transverse lamellae below the expansion of the digit, or 6-7 on the shorter toes. The most distal lamella divided in the middle. A row of enlarged scales along the midline of the digit inferiorly, 8 or 9 on the longer toes, the basal scales being largest, only 4 or 5 on the shortest toe.

Colour of Spirit Specimens.—Above greyish with black spots sparsely arranged; these spots are absent or very small on the head; lower parts whitish.

Measurements of No. 16639.—Total length, 84.5 mm.; from snout to vent, 41 mm.; from snout to ear-opening, 11 mm.; fore-limb, 17 mm.; hind-limb, 23 mm.

Another specimen, very slightly larger but lacking the tail, measures 10·5 mm. across the throat at the angles of the jaw ; from orbit to tip of snout, 5·5 mm. ; from snout to vent, 43 mm.

Only two other species were recognised by Boulenger in his Revised List (1910), one of which, *ocellatus* Blgr., was recorded from Capetown, no doubt erroneously. A third form seems to me worthy of recognition, *braconnieri* Thom., judging from the description. The 3 chin-shields and the back covered with small hexagonal scales seem to indicate a well-marked form.

Since writing the above, I have seen further specimens from Kamanyab, Kaokoveld, S.W.A. (R. F. Lawrence, 1925, S.A.M., No. 17262). These agree with the types in the shape of the snout, of the mental shield and lower labials ; but in one immature example the chin-shields are only a little bigger than the adjoining scales ; and in the largest example the small triangular scale at the distal end of the digit superiorly is not in any way marked out from the neighbouring scales. The measurements of the latter specimen are : from snout to vent, 61 mm. ; from end of snout to ear-opening, 17 mm. ; breadth of head, 15 mm.

Oedura tembulica sp. nov.

This new species, first discovered by Mr. Robert Essex, is described from a series of specimens collected at Cofimvaba, in Tembuland, by Mr. C. W. Wilmot (May 1925). The species is entirely rupicolous, inhabiting the cracks between sun-split rocks on a hillside.

It is a stout form, closely related to *O. amatolica* mihi (Records Albany Museum, vol. iii, p. 350, 1925), but distinguished therefrom by the following characters :—

(a) Digits inferiorly without very broad scales along the median line, excepting the most distal scale, which is greatly elongated transversely. In a large female the condition is as follows : The first toe (shortest) has two pairs of adhesive plates at the distal end of the basal portion, but on this toe one of them is ill developed ; besides the distal scale—which adjoins the smaller adhesive plate—there is only one other enlarged scale inferiorly. The second toe has 2 enlarged scales in addition to the distal one, these two being broader than long. The third has 4 or 5 enlarged scales besides the distal one, and the fourth 3–5 oval scales ; these toes are more slender than the rest. Fifth toe with infero-median scales quite like those on the outer side of the toe. Toes II–IV with small scales inferiorly in their basal

portions. In the male there is a similar condition, but the enlarged subdigital scales are rounded rather than oval, the distal one excepted.

(b) Males with 6-9 preanal pores in a curved line, and an oblique row of 3 tubercles at the base of the tail on each side of the vent, the uppermost much the largest.

(c) Dorsal scales of body granular, sometimes rather pointed, not well flattened and imbricate as in *amatolica*.

Chin-shields small. The mental shield is rather elongated and narrows much towards the apex, where it is considerably narrower than the adjoining first labial. The first labial is also elongated, being longer than broad (in *amatolica* as broad as long). In one adult male specimen the rostral is separated from the left nostril by a small granule, but enters the right nostril. The supraciliary scales in the postero-dorsal part of the orbit are elongated and sharply pointed; there are generally 5 or 6 such scales, the most posterior one largest. The other scales belonging to the same row are small.

The tail is somewhat flattened and segmented by faint lateral constrictions throughout its length; about 20 segments are recognisable in the tail of an immature specimen, but in most adults the tail is reproduced. This segmentation is not, or hardly, noticeable in dorsal view, and the dark markings on the upper surface have no relation with the segmentation. Neither is there any modification in the size or shape of the scales at the junction of the segments above or below. Dorsally, a segment includes 7 rows of scales, but ventrally only 4 rows.

Colour of Spirit Specimens.—Above greyish, with indefinite blackish markings. Sometimes there are indications of irregular cross-bands on the back, but generally the markings on the back, if present at all, are irregular mottlings; on the tail there are dark cross-markings and spots at intervals.

Length from snout to vent, 56 mm.; breadth of head, 13 mm.

The genus *Oedura* has been regarded as a great rarity in South Africa, and undoubtedly such is actually the case in most parts of the country. However, recent explorations, especially by Mr. R. Essex, have served to reveal it as common at certain isolated spots. These are usually, but not always, on inland mountains at high elevation. Each of these haunts seems to be the home of a peculiar form, and there is at present no evidence that any one form is widely distributed, as is the case in the genus *Pachydactylus* and various other geckoes.

Tetradactylus bilineatus sp. nov.

Type.—A single specimen taken in the Burghersdorp district, C.P., by Dr. R. Broom, who presented it to the Albany Museum.

The species is related to *T. tetradactylus* Lacep., but is distinguished therefrom on the following characters:—

(a) The nostril is bordered only by 3 nasal scales, the lowest one of which is elongated. Thus the first labial does not enter the nostril, as is the case in *tetradactylus*, and indeed in all known species, 2 nasals being the rule in this genus.

(b) The frontal scute is broader, being about twice as long as broad, whereas in *tetradactylus* it is $2\frac{1}{2}$ times as long as broad, or even longer.

(c) Third finger considerably longer than the second: in *tetradactylus* it is only slightly longer than the second, or subequal thereto.

(d) Hind-limbs relatively longer, extending backwards as far as the ninth row of caudal scales; in *tetradactylus* only extending as far as the sixth or seventh row. The fore-limb extends backwards over 9 rows of ventral scales: in *tetradactylus* over 8 ventral rows.

There are 63 rows of scales from the occiput to the base of the tail. Femoral pores 4–5. On each side of the vent is a pointed claw-like scale.

Head scales with dark brown spots. A conspicuous dark brown dorso-lateral stripe on each side of the body. These stripes are three scales apart, the two middle scales of each transverse row on the back being devoid of pigment, but the scale lateral thereto being pigmented in its outer half.

Length from snout to vent, 53 mm.; hind-limb, 9 mm.; fore-limb, 7 mm.; tail incomplete.

Bufo rosei sp. nov.

(Plate XXXVII.)

This species is based on a series of specimens collected by Mr. Walter Rose on Muizenberg Mountain during March 1925. It is a very small form, which has hitherto been overlooked, perhaps owing to confusion with the young of *angusticeps*.

The characters of *rosei* are: head broad, snout short, rounded, and not projecting; interorbital space a trifle narrower than the upper eyelid or subequal thereto; vertebral line absent or extremely indistinct; tympanum absent; pupil horizontal, but short outgrowths of the iris in the middle make it somewhat dumb-bell shaped; parotoids not prominent but easily distinguished on account of their

reddish tinge, sometimes much flattened and nearly obsolete, usually separated from the orbit by a considerable space. Dorsal surfaces throughout often quite smooth, without granules, asperities, or warts; sometimes with fairly numerous flattened smooth blister-like warts dorsally and laterally, but such blisters do not generally extend to the head; they are best developed on the sides of the body, several larger ones more or less in a line with the parotoids being faintly tinged with red. Just behind the angle of the mouth there are one or several such excrescences, which also may be red-tinged, and are essentially similar to the parotoids in structure. Throat and belly quite smooth. In front of the vent there is a large subcircular area over the fat bodies, where the skin is strongly corrugated. First finger subequal to the second, or even very slightly longer. Toes without web; a small inner metatarsal tubercle, outer one very weak; subarticular tubercles rather weakly or moderately developed, showing signs of doubling on the longer digits; toes slender, cylindric, and rather long, the first being well developed; tarsal fold wanting. The hind-limb being carried forwards along the body, the tarso-metatarsal articulation reaches to a point between the parotoid and the orbit, or to the middle of the eye.

Dorsally dark grey, with more or less distinct indications of three pale stripes; the mid-dorsal stripe may extend from the tip of the snout to the vent; the lateral stripes extend backwards from the red-tinged parotoids to the inguinal region; besides, the dorsal surface has numerous inconspicuous black spots or blotches of varying shape and size, more or less symmetrically disposed; sides of body marbled with black and pale grey, sometimes with white spots below; throat white, belly dirty white and sometimes with faint dark markings, the corrugated area over the fat-gland tinged with yellow. Sometimes the three dorsal stripes are broken up or obsolete, at other times conspicuous.

Length from snout to vent, 25 mm.

This small toad, though differing greatly from a typical *Bufo* in its soft skin and dorsal striping, is clearly referable to the group of Cape species including *angusticeps*, *amatolica*, and *gariensis*. These all have the belly skin more or less smooth, but the dorsal surface may be nearly smooth or covered with asperities even in specimens from the same locality (*gariensis* at Victoria West). A peculiar character of all of them, but only feebly represented in *regularis*, is the projection of the iris at its middle point above and below, producing a dumbbell-shaped pupil.

The absence of the tympanum is a special character of *rosei*, which separates it from any of these species, although *angusticeps* may have an indistinct tympanum. The latter species has the inner metatarsal tubercle much more strongly developed, and the toes are all more or less fringed with web, so that they are characteristically flattened over the greater portion of their length and pointed at the tip; the innermost toe is thus subtriangular rather than cylindrical, as in *rosei*.

In the soft skin and comparatively feeble development of the pedal tubercles, *rosei* resembles the Cameroon species, *B. preussi* Matschie, but perhaps only superficially; and the latter seems easily distinguishable on the webbing of the feet (see F. Nieden's detailed account of the genus in his work, *Anura I, Das Tierreich* (46), Berlin and Leipzig, 1923).

Three species of *Bufo* are now known from the neighbourhood of the Cape Peninsula—*regularis*, *angusticeps*, and *rosei*; a fourth (*granti*) was once recorded from Durban Road by Mr. Boulenger; but this record may be regarded with suspicion, inasmuch as the species has not been taken by the local collectors in that district and is, moreover, essentially a Karroo type. When expressing his suspicion of that record, Mr. Rose wrote to me as follows: "We live within gunshot of the Durban Road, and have gone over that region with a fine comb, day and night, wet and dry, and have probably turned over every log, stone, or tin within miles. I think it is reasonable to suppose that *B. granti* is not found in our neighbourhood at all. I am inclined to think that the same applies to *Rappia marmorata* and *Megalixalus spinifrons*, of both of which a solitary specimen is reported from near our home."

I have drawn attention to these doubtful records from the Cape Peninsula on a previous occasion, but published records are apt to survive a long time, stultifying our distribution studies.*

* I take this opportunity of referring to Dr. Noble's most useful check-list of the Amphibia of Africa,† the first that has been published, at any rate within recent decades. Most workers on the South African fauna will understand that the stated range of many frogs and toads as "South Africa" is not to be taken too literally, for actually not a single species can be said to occur throughout our region, with the possible exception of *Xenopus laevis*. Some species of very wide distribution in the warmest parts of Africa, such as *Rana angolensis* and *Bufo regularis*, range throughout all the northern half of our region, and southwards far into the Eastern Cape Province, but are replaced by other species throughout the greater portion of the western half of the Cape. Other widespreading species, such as *Rana adpersa*, *R. oxyrhynchus*, *Phrynomantis bifasciata*, and *Hemisus*

† Bulletin, American Museum Nat. Hist., vol. xlix, pp. 147-347, 1924.

The absence or weak development of the tympanum is a character peculiar to various species of Batrachians inhabiting the Cape Peninsula, e.g. *Bufo rosei*, *Microbatrachus capensis*, *Arthroleptella lightfooti*, *Cacosternum capense*, *Breviceps gibbosus*, *Rappia horstockii*, and *Heleophryne rosei*. This seems best interpreted as a primitive condition, and that of *Rana*, etc., as secondary.

MICROBATRACHUS gen. nov.

Related to *Cacosternum* Blgr. and *Anhydrophryne* Hwtt., but differing therefrom in the presence of precoracoid and omosternum. Sacral diapophyses strongly dilated, definitely of the Engystomatid type. Cranium without frontoparietal fontanelle; maxillary and premaxillary teeth present, but no vomerine teeth; outer metatarsals slightly separated by web distally. Pupil horizontal.

Genotype.—*Phrynobatrachus capensis* Blgr.

Microbatrachus capensis (Blgr.).

(Plate XXXVI, figs. 5 and 6. Text-fig. 3.)

Ann. S. Afr. Mus., vol. v, p. 538, 1910.

Mr. Rose has taken a series of specimens of this interesting species, which at present is only known from shallow pools on the Cape Flats. The distribution is apparently very restricted, although the species is quite abundant in those pools.

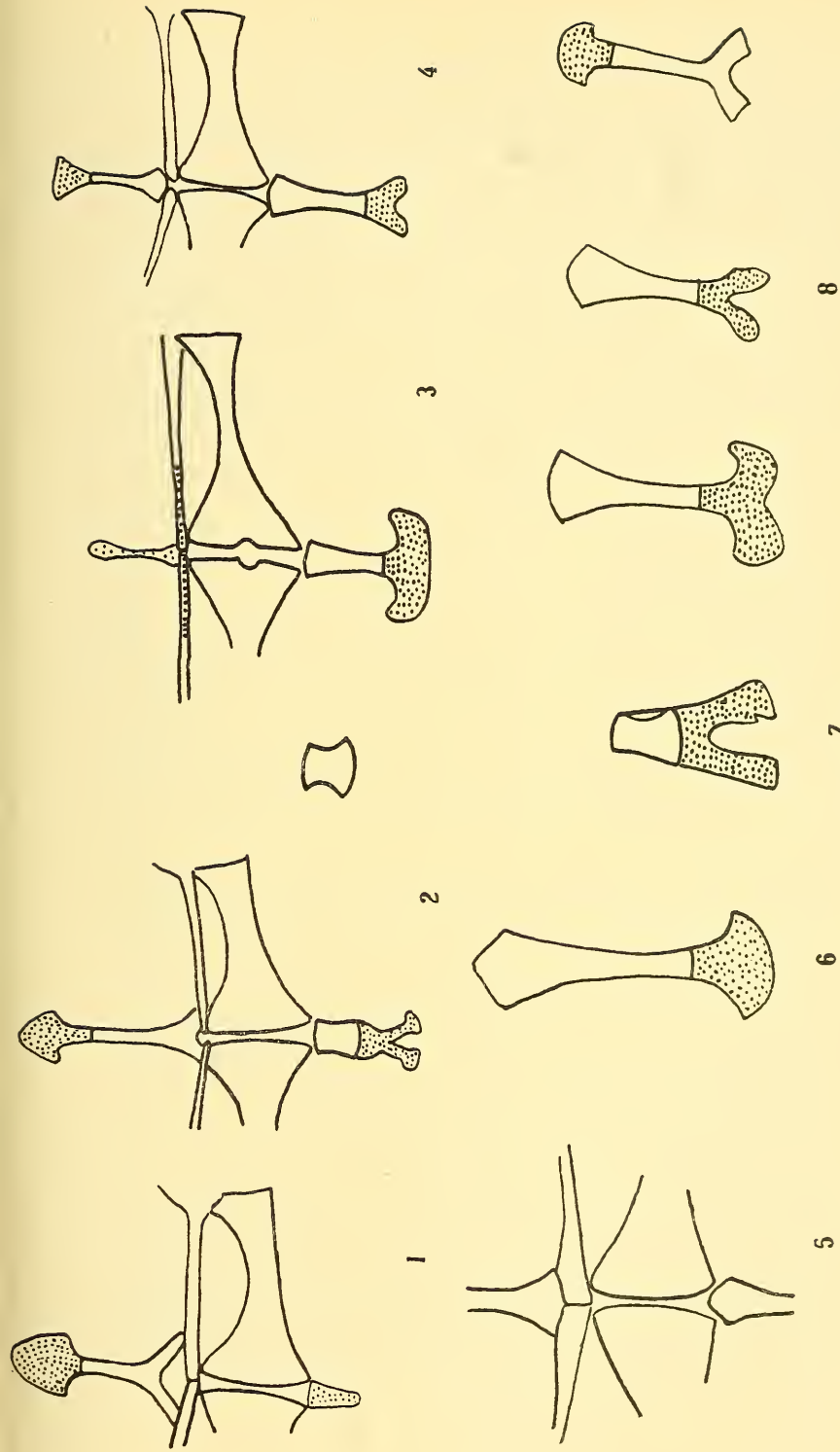
The degree of dilation of the sacral diapophyses is a character of doubtful importance in the separation of families, yet there is good generic value therein; and on this character alone *capensis* cannot be included in the same genus with *Phrynobatrachus* or with

guttatum, are altogether unrepresented in the Western Province. The two last mentioned are recorded respectively in the check-list as "South Africa northward to Angola in the west, to northern Kenya Colony in the east," and "South Africa north to Southern Angola and Zululand." I have mentioned these facts in order to emphasise that we think it no longer sufficient to treat South Africa as a homogeneous area. It is preferable to list each of the various provinces separately, as in the recently published "Systema Avium Ethiopicarum" of W. L. Sclater, or at least to indicate the southern limits of each species. This would reveal the peculiarities of the western Cape fauna; even in the well-watered regions of the southern coast, this part of South Africa has a very small Amphibian fauna compared with that of Natal, for instance. In actual size it is certainly an insignificant portion of the great continent, but its fauna has a very special interest to students of zoogeography.

Corrigendum, p. 420 *et seq.*

For MICROBATRACHUS *read* MICROBATRACHELLA, the former name
being preoccupied (Roux, 1910).

Annals S.A. Museum, Vol. XX, Part 6.



Figs. 1-8.

Pectoral apparatus in (1) *Arthroleptis wahlbergi* Smith; (2) *Phryganobatrachus natalensis* Smith, female example, with bony metasternum of a male on the right; (3) *Microbatrachus capensis* Bgr., showing feebly ossified omosternum and ventral half of precoracoid cartilaginous; (4) *Arthroleptella bicolor* sp. nov.—the shape of the bony metasternum is somewhat variable, being in some specimens almost of the same breadth throughout; (5) *Arthroleptella lightfooti* Bgr.; (6) metasternum of another specimen of *lightfooti*; (7) metasternum of *Phryganobatrachus plicatus* Gbur.; (8) two metasterna and omosternum of *Nalabatrachus bonhebergi* Hewitt and Methuen—omosternum in some specimens not distinctly λ -shaped.

Natalobatrachus, which are of the Ranid type. The diapophyses of *capensis* are more enlarged than those of *Anhydrophryne*.

The shoulder girdle (text-fig. 3) also differs from that of *Phrynobatrachus*; the omosternum and precoracoid seem to be in process of degeneration, the former being only feebly ossified and the latter being purely cartilaginous in its ventral portion; the expanded ventral end of the coracoid has a weakly ossified area in the middle, and thus it appears to be double-headed, as in *Cacosternum capense* mihi (Records Albany Mus., vol. iii, p. 367, pl. xv): the metasternum is a strong bony rod and carries a broadly expanded cartilaginous plate.

In the pedal characters there is only superficial resemblance to *Phrynobatrachus*. No trace of a tarsal tubercle occurs, and there is only one metatarsal tubercle. The outer metatarsals are only slightly separated by web, rather less so than in *P. natalensis*. The digits are long, slender, and finely tapering. Terminal phalanx rather long and slender, but swollen at the tip, and tending to become anchor-shaped. Tongue bifid behind. Tarso-metatarsal articulation of adpressed hind-limb reaching the eye in females, midway between the eye and end of snout in adult males. Surfaces without warts, granulations, or asperities; no granulation under or behind the thighs. Body not depressed, snout short, rounded, or slightly pointed in male; latter paler than female, third finger as in female or a trifle longer, first finger swollen and modified as in *Cacosternum*, a sub-gular vocal sac.

The colour pattern is distinctive: a black and white reticulation on the belly; throat either pale, or dark with irregular white spots; a few very fine white spots may also occur on the lower surfaces of the limbs, but generally not so; dorsal surface with small dark spots and sometimes a continuous white mid-dorsal streak; an oblique dark stripe from the eye to the base of the fore-limb. In life "the colouring shows an unlimited range, greens and olives predominating, and even red ones occurring; the power of colour-changing seems great, the rest colour being olive brown" (W. Rose).

The characteristic ventral coloration has considerable resemblance to that of *Anhydrophryne*, and, to a less extent, to *Cacosternum*.

Microbatrachus is of much phylogenetic interest. Firstly, it represents the progenitor of the two more specialised genera just mentioned. It is, moreover, the simplest of all the African Engystomatids, occupying a position comparable to that of *Heleophryne* amongst the Bufonids. These three allied genera constitute an isolated group not directly connected with typical Engystomatids

such as *Phrynomantis*, but possibly ancestral thereto. On the other hand, the variation of the sacral diapophysis character is such that this group is easily connected up through *Anhydrophryne* with primitive Ranids, so that there may even be remote relationship with *Phrynobatrachus*. The affinity with *Anhydrophryne* is also noteworthy as a further instance of connection between the faunas of the South-west Cape and of the Amatola region.

Several very young frogs and tadpoles supplied by Mr. Rose enable me to give some notes on the larval characters. The two oldest tadpoles (text-fig. 9, *b*) are in the stage with the hind-limbs well emerged and fore-limbs still hidden. There is a pair of well-developed and

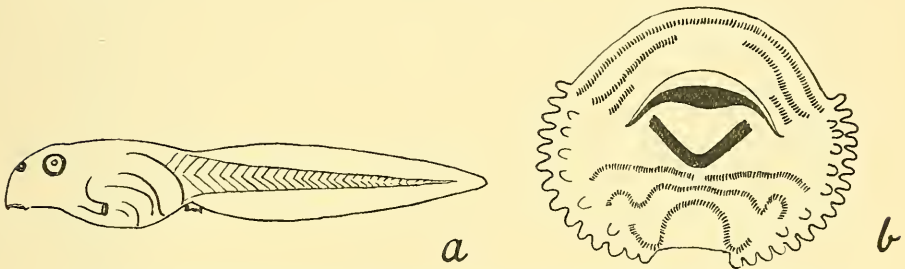


FIG. 9.—*Microbatrachus capensis* (Blgr.). *a*, early tadpole in side view, enlarged. *b*, oral apparatus of late tadpole: it is stretched out antero-posteriorly to expose the jaws. In earlier stages the lateral papillae are longer.

black horny jaws; they are rather widely extended, and the cutting margin of the upper jaw is sinuous, with a broad convexity in the middle as a beak. Three upper and three lower tooth-rows, all conspicuous but single; in the upper series, only the outermost one is complete and the innermost one is much reduced; the lower series has three well-developed rows, all somewhat sinuous or folded into curves, and the inner one is incomplete mesially. Mouth disc large, transversely elongated and ventral. Lateral lobes edged with papillae, two rows of which are more or less developed. Nostrils rather large, their distance apart about $2\frac{1}{2}$ –3 times the long diameter of a nostril.

Body of moderate proportions, neither very deep nor depressed. Tail crests not deep, the margin above and below only lightly curved, tapering gradually to the end, which is acute; greatest depth of tail at any point scarcely, if at all, exceeds that of the body. Spiracle not distinctly traceable in the specimens. Left fore-limb emerges before the right one. Upper surfaces generally rather feebly infuscated;

no dark spots on tail or body. Sometimes a white mid-dorsal streak on head and body. Lower surfaces of body and limbs whitish, the coils of the intestine being invisible through the opaque belly skin.

Total length, 25 mm. ; tail, 18 mm.

At a somewhat later stage the dorsal surface of the juvenile frog shows numerous characteristic ocelli with small white centres and broader blackish margins ; the ventral surfaces remain an opaque white without blackish markings.

In tadpoles at an earlier stage (text-fig. 9, *a*), with the hind-limb just protruding, the spiracle is easily seen ; it is situated ventro-laterally, the elongated tube being directed straight backwards but not dorsalwards. The tooth-rows are much like those of older specimens, but are not so much folded ; the innermost row of the upper series may be entirely obsolete, but, on the other hand, the innermost row of the lower series may be unbroken mesially ; the outermost lower row may be less than $\frac{1}{2}$, and at any rate is not more than $\frac{2}{3}$, the length of the middle lower row. Eyes rather large. Nostrils prominent, their distance apart being about half that between the orbits. Anus opening on right side of base of caudal fin, close to its lower edge. Breadth of body greater than its depth. Seen from above, the outline of head and body is ovate. Integument transparent, the few coils of the intestine clearly visible. No black spots or streaks, but there are innumerable very minute granules of melanin in the skin ; these are fairly generally distributed, but are absent or ill developed over the otic region on each side of the head, over the hinder part of the belly mesially, and over the throat region. Upper caudal crest commencing at a point only slightly anterior to the vertical of the vent, considerably posterior to the vertical of the spiracle. Tail tapering towards the tip, where it is pointed but not acutely so ; in shape it is more or less elongate hastate, being about $1\frac{1}{2}$ – $1\frac{2}{3}$ times the length of head and body combined ; the exact shape varies, being sometimes tapering more or less uniformly from base to tip, at other times deepest about the middle of its length.

The dentition of the tadpole has considerable resemblance to that of *Cacosternum* ; however, in the latter, the whole of the lower lip is fringed with papillae as at the sides, there may be traces of a fourth upper row of teeth, the outermost lower row is better developed, also the oral disc is smaller than that of *Microbatrachus*. The spiracle in *Cacosternum* is not quite so ventrally situated and its tube is directed obliquely upwards.

In the arrangement of the tooth-rows and of the fringing papillae,

Microbatrachus tadpoles resemble *Bufo*. This, however, is possibly a result of convergence, for in the position of the anus the two seem well separated. The anal character is suspected to be of importance because of a certain constancy in genera which show considerable variation in the dentition arrangement; on this character, *Bufo* and *Heleophryne* agree together, although differing greatly in the mouth parts.

In an important paper on Indian tadpoles (Records of the Indian Museum, vol. xv, pt. i), Annandale and Narayan Rao state that it does not seem possible (except in the case of *Oxyglossus*) to distinguish the larvae of the different genera of this family, the Ranidae. To realise the great diversity in structure that may occur amongst tadpoles of the same genus, *Rana*, it is only necessary to consult Annandale's previous paper on South Indian tadpoles (see Records of the Indian Museum, vol. xv, pl. i).

Nevertheless, the above-mentioned authors indicated certain family differences amongst the tadpoles of the Indian plains. In the Engystomatidae of India there is no mouth-disc, no horny teeth or beak, and the spiracle is in the midventral line. On the characters given by these authorities, *Cacosternum* and *Microbatrachus* would exactly fit in with the Ranidae.

Natalobatrachus bonebergi Hewitt and Methuen.

Trans. Roy. Soc. S. Afr., vol. iii, p. 107, 1913.

Dr. G. K. Noble has on several occasions pronounced this species to be nothing more than a *Phrynobatrachus*. A relationship to that genus was indeed indicated by Methuen and myself when we proposed the new generic name of *Natalobatrachus*. At that time we were chiefly impressed by the T-shaped distal phalanges as a distinguishing character from *Phrynobatrachus*. A recent investigation of the pectoral girdle (see text-fig. 8) has again satisfied me that generic separation is well justified. The metasternum of *bonebergi* is quite different from that of *P. natalensis*; the bony portion is a long rod greatly widened in front and tapering behind. The precoracoid is strong and bony. Here I may remark that Noble's figures of the pectoral girdle of this species, and probably of others, do not correctly represent some of the characters concerned, presumably because of alteration in the skeletonising process. The drawings I now give are based on simple dissections.

It is clear, as Noble points out, that *bonebergi* is closely related to

the Congo species described by Boulenger as *Arthroleptis dendrobates*, and now called *Phrynobatrachus dendrobates* by Noble. But I cannot agree that it is also closely allied to *Phrynobatrachus plicatus*, as he asserts. The metasternum of *plicatus* (text-fig. 7) is definitely of the *Phrynobatrachus* type. In some genera the metasternum is certainly very variable, but at least an occasional importance of this character is revealed by an examination of the metasternum in various South African species of *Rana*. These prove to be essentially similar, although there are specific differences. Even such widely different frogs as *Rana delalandi* and *R. fasciata*, which are still referred to distinct genera by eminent authorities, show much resemblance in their metasterna.

For the present therefore, and until intermediate conditions are discovered, *Natalobatrachus* should be employed for the reception of the two species, *bonebergi* and *dendrobates*. Externally, it considerably resembles those species of *Phrynobatrachus* which have discs at the tips of the digits, but its discs are broader, the body more slender, and the tarsal tubercle obsolete or indistinct; also, the males are quite devoid of external subgular vocal sacs.

It seems probable that the presence of an elongated median papilla on the tongue is also of generic importance; it occurs in *natalensis*, *perpalmatus*, and *plicatus*, but is wanting in *bonebergi*. It may be added that in the most recent revision of the genus *Phrynobatrachus*, that by de Witte (Revue Zoologique Africaine, vol. vi, fasc. 2, 1919), *bonebergi* and *dendrobates* are not included; on the other hand, *capensis* is admitted, the author remarking that this is the only species of *Phrynobatrachus* that lacks a tarsal tubercle, his notes on *capensis* being based solely on the original description, which we now know to be very incomplete.

ARTHROLEPTELLA gen. nov.

Resembling *Arthroleptis* (Smith) in most of its characters, but differing in the characters of the pectoral girdle. In *Arthroleptis* the omosternum is λ -shaped and well developed, being much larger than the metasternum, which is cartilaginous: in *Arthroleptella* the omosternum is entire, and somewhat smaller than the metasternum, which has a well-developed bony rod. Sacral diapophyses typically Ranid, scarcely dilated at the apex.

Genotype.—*Arthroleptis lightfooti* Blgr.

The shoulder girdle of *Arthroleptis* and related genera has been studied by Dr. G. K. Noble, who furnished a useful series of illustra-

tions in his paper on the Herpetology of the Belgian Congo (Bulletin American Mus. Nat. Hist., vol. xlix, pp. 143-347, 1924). His account, however, somewhat discredits the value of this character as a basis for generic distinction. He even tells us that the girdles of *A. wahlbergi* and *P. natalensis*, the type species of *Arthroleptis* and *Phrynobatrachus* respectively, are identical. Now, such is by no means the case. *A. wahlbergi* (text-fig. 1) has a distinctly λ -shaped omosternum, and the short cartilaginous metasternum tapers behind; the precoracoid is a strong bony rod. There is no bony style to the sternum, as is wrongly asserted in the Brit. Mus. Cat. *P. natalensis* (text-fig. 2) has also a long well-developed omosternum, triangularly expanded at the base, but not definitely λ -shaped; it has a broad and strong, but rather short, bony metasternum, a little constricted in the middle, and sometimes broadest distally, and there is a bifid cartilaginous xiphisternum; the precoracoid is very slender and cartilaginous or feebly ossified. These two girdles are easily distinguishable, and it is quite clear from Noble's figures that the two types are of considerable stability; *A. wahlbergi* of Natal seems indistinguishable in its girdle from *A. batesii* of Cameroon, from *A. variabilis* of Cameroon, and from *A. xenodactylus* of Tanganyika. *P. natalensis* again is matched precisely in its pectoral girdle by *P. perpalmatius* of Lake Moero.

Arthroleptella lightfooti (Blgr.).

(Plate XXXVI, figs. 1-4, 8, and text-figs. 5 and 6.)

Ann. S. Afr. Mus., vol. v, p. 538, 1910.

Mr. Rose has collected this species at various localities in the Cape Peninsula, viz. from Skeleton Gorge and Devil's Peak Gorge on Table Mountain, from Muizenberg Mountain, and from Silvermyn Valley near Fish Hoek. As I learnt five years ago from Mr. Barnard, and more recently from Mr. Rose, this little frog dispenses with the free-swimming tadpole stage, like *Anhydrophryne* and *Breviceps*. "During November I found several small clusters of eggs, about five eggs in each cluster. These had been deposited in damp moss near a small waterfall. All stages were present, the comparatively extremely large egg with white nucleus, the embryo with yolk-sac, the active and fully tailed tadpole, and the matured animal. The fall being nearly perpendicular, no swimming stage was possible; and, in fact, some of the tailed tadpoles were drowned on the way home in the water at the bottom of the receptacle used. . . . The vocal note is a very high-pitched chirp, like that of a cricket" (W. Rose).

Externally, this species differs considerably from *Arthroleptis wahlbergi* (Plate XXXVI, fig. 7). The latter has a very distinct tympanum; males without any indication of external vocal sac; first and second fingers subequal; subarticular tubercles of digits well developed, and the single inner metatarsal tubercle is strong; canthus rostralis fairly well defined; a dark streak from the eye above the tympanum towards the fore-limb, and in front this is continued from the eye to the nostril. On the other hand, *lightfooti* has a very indistinct tympanum; males with slit-like invaginations of unmodified integument on each side of the throat, these slits being not deep; first finger shorter than the second; subarticular tubercles of digits rather weak, inner metatarsal tubercle very small and, in addition, a still smaller outer metatarsal tubercle (not mentioned in the original description); canthus rostralis not defined. The omosternum has its cartilaginous portion nearly as long as the bony portion.

I have no doubt but that *lightfooti* is more nearly related to *Arthroleptis schebeni* Nieden (Sitz. Gesell. Naturforsch. Freunde, Berlin, 1913, No. 10), which is based on four examples from Klein Nauas in the Kalahari, other specimens being recorded from Rehoboth. Dr. F. Werner (in Beitr. zur Kenntnis d. Land- und Süßwasserfauna Deutsch-Südwestafrikas, Reptilia u. Amphibia, Hamburg, 1915) gave other records from the neighbourhood of Windhoek, and added somewhat to the description; but neither of these authors gave any information on the shoulder-girdle characters. In Noble's key to the genus, *schebeni* is placed in the section characterised by the single metatarsal tubercle, no tarsal tubercle, third finger of male greatly elongated; and it is distinguished from all other members of that section from the fact that the tympanum is hidden. However, from the accounts of Nieden and Werner, it seems clear that there are two small metatarsal tubercles. It is chiefly on the indication of the tympanum and the metatarsal tubercles that I place *schebeni* provisionally in the genus *Arthroleptella*.

It is possible that several races of *lightfooti* occur in the Cape Peninsula and neighbourhood. The type specimen, an adult female recorded from Newlands, is somewhat faded, but apparently was only sparingly infuscated when fresh, the lower parts of head and body being quite devoid of dark pigmentation: there is a broad dark stripe from the orbit, passing through the tympanum towards the base of the fore-limb, and in front there is a dark streak from the orbit to the nostril. There are also dark patches and spots on the upper lip,

and on each side of the body dorsally is an irregular row of indistinct ocelli, which are rather distinctive of the species.

Concerning the living colours of some specimens taken at Skeleton Gorge, Mr. Rose wrote as follows: "The dorsal colour ranges from dark oak or russet brown to black, the same individual at times being any of these colours, the change being induced probably by light and emotion. The ventral surface at times is quite white, though many were found with ventral surface almost black, especially on the throat."

Preserved male specimens from Skeleton Gorge all have the throat and breast strongly infuscated, sometimes quite black; the hind half of abdomen is finely speckled black and white, the latter generally predominating; thighs and legs ventrally dark brown with small or minute white spots. The dorsal coloration is very variable; often a reddish tinge is present on the arms and back; there is sometimes a white mid-dorsal line and a series of dark ocelli with white centres on each side of it, several such ocelli being occasionally present on the upper surface of the thighs and tarsi and over the eye. These ocelli may be longitudinally elongated and partially fused into dark dorso-lateral stripes.

The total length is 16 mm.

Preserved specimens from Devil's Peak are appreciably larger, the total length being 20 mm. Also, the adult males are more strongly infuscated, very little white persisting on the abdomen. Young specimens, however, have the whole ventral surface of the body white, with or without a fine black reticulation.

Specimens from Muizenberg Mountain are small, total length 16 mm., and the ventral surface is not so deeply pigmented. An adult female is quite white throughout the ventral surfaces of head and body, but the lower lip is blackish, and the lower surfaces of thighs and legs are white with blackish reticulation, sides of body with blackish reticulation; however, another female has a fine blackish reticulation extending over the white of the lower surface throughout. An adult male has infuscated throat and breast, and the greater part of the abdomen is whitish, but finely marked and speckled with black.

Arthroleptella bicolor sp. nov.

(Plate XXXVI, figs. 9 and 10. Text-fig. 4.)

This new species is based on a series of specimens collected at Wellington, C.P., by K. H. Barnard and R. F. Lawrence in 1922;

types in the collection of the South African Museum. The species is closely related to *lightfooti*, and possibly a range of intermediates between the two will be found. However, it differs from its Cape Peninsula ally in the form of the xiphisternum (see fig. 4), which in *bicolor* is bifid, but in *lightfooti* is more or less anchor-shaped, not divided posteriorly. It is also larger and more robust than *lightfooti* and is differently coloured.

Postero-ventral portion of the thigh with conspicuous scale-like corrugation of the skin extending rather more than half the length of the thigh.

Tongue with deep median incision posteriorly; in *lightfooti* with a broader, more shallow, median incision. Dorsal skin with slight tendency to wartiness, especially over the snout, and also posteriorly; but this is not traceable in some states of preservation. From the angle of the mouth a slight skin fold passes towards base of fore-limb. Interorbital space broader than upper eyelid. Tympanum indistinct. Fingers and toes with slightly swollen tips: toes without web: sub-articular tubercles all small; two metatarsal tubercles, but outer one minute and inner one small: no tubercles on palms or on soles. Adpressed hind-limb with tarsal tubercles reaching to anterior border of eye in females, to the end of the snout or a trifle beyond in males.

Colour of Spirit Specimens.—Upper parts of body and limbs black; female with whole ventral surface of head and body white, one or several white patches on a black background on the thigh, and smaller white markings on the toes, fingers, arm, and fore-arm; male with black throat and white belly, limbs with conspicuous white markings throughout their length, a conspicuous white patch on the chin in one specimen, which in a second example is practically obsolete.

Measurements.—Total length, male 17 mm.; female 21·5 mm.

EXPLANATION OF PLATES.

PLATE XXXV.

FIG.

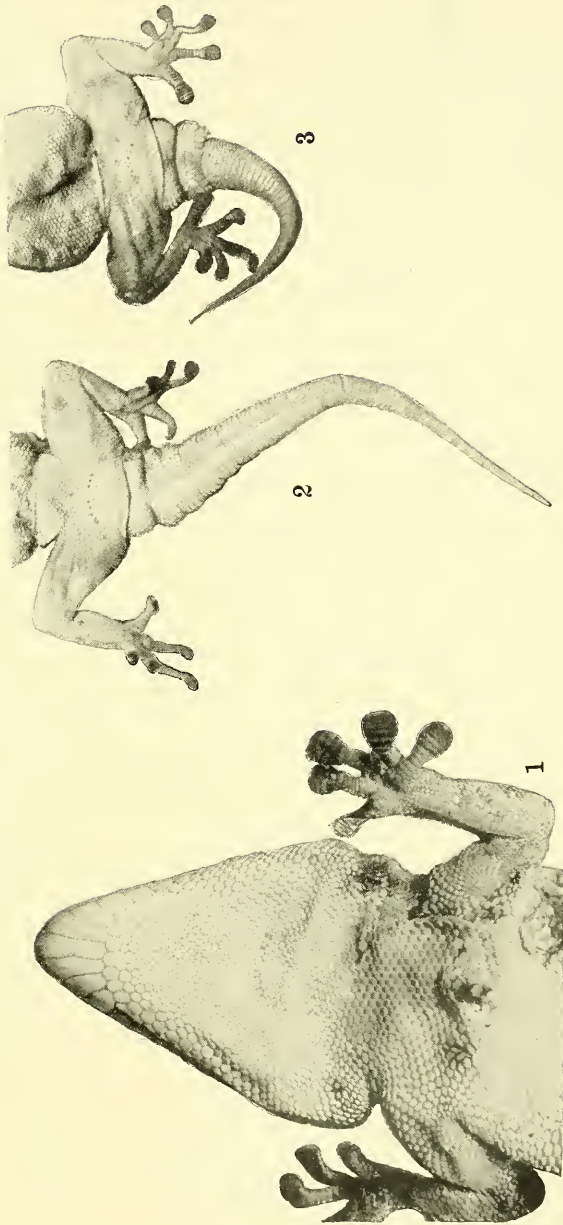
1. *Rhoptropus barnardi* sp. nov. Ventral view, showing characteristic mental and chin-shields, etc., enlarged.
2. *Rhoptropus barnardi* sp. nov. Ventral view of anal region and tail of male.
3. „ „ sp. nov. Ventral view of specimen with reproduced tail.

PLATE XXXVI.

1. *Arthroleptella lightfooti* (Blgr.). Dorsal view of male from Skeleton Gorge, Table Mountain.
- 2 and 4. Females of same species from Muizenberg, ventral view.
3. Male from Muizenberg, ventral view.
- 5 and 6. *Microbatrachus capensis* (Blgr.). Two females in ventral view.
7. *Arthroleptis wahlbergi* (Smith). Dorsal view, specimen from Mariannahill, Natal.
8. *Arthroleptella lightfooti* (Blgr.). Ventral view, male from Skeleton Gorge, Table Mountain.
- 9 and 10. *Arthroleptella bicolor* sp. nov. Female and male, ventral view.

PLATE XXXVII.

Bufo rosei.



RHOPTROPUS BARNARDI sp. nov.



1



2



3



4



5



6



7



8

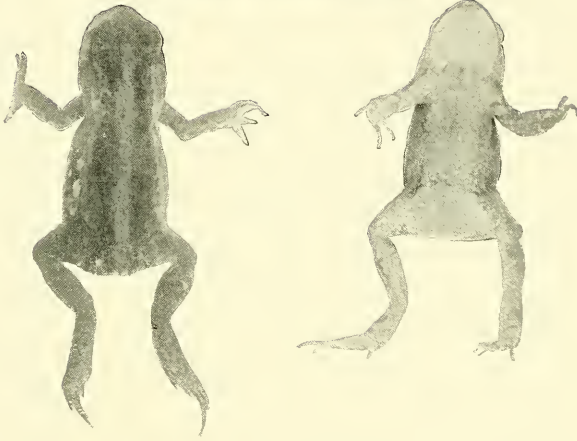


9



10

SOUTH AFRICAN BATRACHIA.



BUFO ROSEI sp. nov.